

WHAT IS CLAIMED IS:

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1. A liquid crystal display comprising:
a first substrate;
a common electrode which is formed on the first substrate;
a plurality of protrusions formed on the common electrode;
a second substrate facing the first substrate; and
a pixel electrode having a plurality of aperture formed on the second substrate.
- 10 2. The liquid crystal display of claim 1, further comprising a chiral nematic liquid crystal layer having negative dielectric anisotropy which is interposed between the first and the second substrates.
- 15 3. The liquid crystal display of claim 2, further comprising two vertical alignment layers which are formed on inner surfaces of the first and the second substrates respectively and align the molecular axes of liquid crystal molecules in the liquid crystal layer in a direction perpendicular to the substrates.
- 20 4. The liquid crystal display of claim 1, further comprising a first and a second polarizers attached to outer surfaces of the first and the second substrates respectively, polarizing directions of the first and the second polarizers being perpendicular to each other.
5. The liquid crystal display of claim 4, further comprising a first compensation film attached either between the first substrate and the first polarizer or between the second substrate and the second polarizer.
6. The liquid crystal display of claim 5, wherein the first compensation

film is a biaxial compensation film.

7. The liquid crystal display of claim 6, wherein a slow axis of the first compensation film is parallel or perpendicular to the polarizing directions of the first and the second polarizers.

8. The liquid crystal display of claim 5, further comprising a second compensation film attached either between the first substrates and the first polarizer or between the second substrate and the second polarizer.

9. The liquid crystal display of claim 8, wherein the first and the second compensation films are an a-plate and a c-plate compensation films respectively.

10. The liquid crystal display of claim 9, wherein a slow axis of the a-plate compensation film is parallel or perpendicular to the polarizing directions of the first and the second polarizers.

11. The liquid crystal display of claim 4, wherein the apertures have a shape of a wedge-shaped line having width.

12. The liquid crystal display of claim 4, wherein the protrusions have symmetrical cross sections, and have a shape of a wedge-shaped line having width, and the apertures and the protrusions are arranged alternately.

13. The liquid crystal display of claim 12, wherein the protrusion has a first branch extending along an edge of the pixel electrode from a position at which the aperture meets the edge of the pixel electrode with an acute angle.

14. The liquid crystal display of claim 13, wherein the width of the first branch decreases as goes from the protrusion to an end of the first branch.

5 15. The liquid crystal display of claim 14, wherein the protrusion has a second branch extending from a convex point of the protrusion toward the aperture; and

the aperture has an extension extending from a convex point of the aperture toward the protrusion.

10 16. The liquid crystal display of claim 15, wherein the width of the extension decreases as goes to an end of the extension; and

the width of the second branch decreases as goes to the edge of the pixel electrode.

15 17. The liquid crystal display of claim 12, wherein the polarizing directions of the first and the second polarizers make an angle of 45° with the aperture and the protrusion.

18. The liquid crystal display of claim 12, wherein the width of the aperture is 3 to 20 microns.

20 19. The liquid crystal display of claim 18, wherein the width of the protrusion is 3 to 20 microns.

20. The liquid crystal display of claim 19, wherein the distance between the aperture and the protrusion is 5 to 15 microns.

21. The liquid crystal display of claim 20, wherein the height of the protrusion is 0.3 to 3 microns.

22. The liquid crystal display of claim 4, wherein the aperture has a shape of cross including a first and a second portions crossing each other at a right angle.

23. The liquid crystal display of claim 22, wherein the shape of the protrusion is a tetragon surrounding the aperture.

24. The liquid crystal display of claim 23, wherein the width of the aperture decreases as goes from a center of the aperture to ends of the aperture.

25. The liquid crystal display of claim 24, wherein the center of the cross is diamond-shaped.

26. The liquid crystal display of claim 25, wherein the distance between the apertures is 10 to 50 microns.

27. The liquid crystal display of claim 22, wherein the first and the second portions are parallel to the polarizing axes of the first and the second polarizers respectively.

28. The liquid crystal display of claim 23, wherein the protrusion is located substantially outside edges of the pixel electrode.

29. The liquid crystal display of claim 23, wherein a portion of the protrusion overlaps edges of the pixel electrode.

30. The liquid crystal display of claim 4, wherein the aperture has an X shape including a first and a second portions crossing each other at a right angle.

31. The liquid crystal display of claim 30, wherein the protrusion surrounds the X shaped aperture.

32. The liquid crystal display of claim 31, wherein the first and the second portions are parallel to the polarizing axes of the first and the second

polarizers respectively.

33. The liquid crystal display of claim 30, wherein the protrusion is located substantially outside edges of the pixel electrode.

34. The liquid crystal display of claim 30, wherein a portion of the protrusion overlaps edges of the pixel electrode.

35. The liquid crystal display of claim 1, wherein the protrusions are made of polyimide.

36. The liquid crystal display of claim 1, wherein the protrusions are made of photoresist.

37. The liquid crystal display of claim 1, further comprising a black matrix overlapping the protrusions on the second substrate.

38. The liquid crystal display of claim 37, further comprising a wire overlapping the aperture patterns on the first substrate.

39. The liquid crystal display of claim 38, wherein the wire is a gate wire.

40. A liquid crystal display comprising:
a first substrate including a pixel electrode having at least a wedge-shaped aperture; and

a second substrate which is opposite the first substrate and includes a common electrode and at least a wedge-shaped protrusion on the common electrode, the protrusion being parallel and alternate to the aperture.

41. The liquid crystal display of claim 40, further comprising a black matrix on the second substrate, the black matrix including a first portion

overlapping the protrusion, a second portion passing through bent points of the protrusion the aperture and a third portion covering a region where the protrusion and the aperture meet a boundary of the pixel electrode.

42. The liquid crystal display of claim 41, wherein the black matrix further includes a fourth portion overlapping the protrusion.

43. The liquid crystal display of claim 40, wherein the third portion of the black matrix is triangular.

44. The liquid crystal display of claim 40, further comprising a wire overlapping the aperture on the first substrate.

45. The liquid crystal display of claim 44, wherein the wire is a gate wire.

46. The liquid crystal display of claim 40, wherein an edge of the pixel electrode between the aperture and the protrusion makes a right angle with the aperture.

47. A liquid crystal display comprising:

a first substrate;

a common electrode formed on the first substrate;

a plurality of protrusions formed on the common electrode;

a second substrate facing the first substrate;

a pixel electrode having a plurality of apertures formed on the second substrate; and

a liquid crystal layer having negative dielectric anisotropy which is interposed between the first substrate and the second substrate.

wherein the liquid crystal layer has four domains which have different tilt directions due to the apertures and the protrusions, and the long axes of molecules in the liquid crystal layer in the adjacent domains are perpendicular to each other.

5 48. A manufacturing method of a liquid crystal display comprising the steps of:

forming a plurality of protrusions a first substrate;

forming a pixel electrode having a plurality of apertures on a second substrate; and

10 assembling the first substrate and the second substrate such that the protrusions and the apertures are alternately arranged.

49. The manufacturing method of the liquid crystal display of claim 48, wherein the protrusions are made of photo-sensitive material.

15 50. The manufacturing method of the liquid crystal display of claim 49, wherein the step of forming the protrusions comprises the steps of:

coating a photo-sensitive film, exposing the photo-sensitive film, developing the photo-sensitive film, and baking the photo-sensitive film.

20 51. The manufacturing method of the liquid crystal display of claim 48, further comprising the step of forming vertical alignment layers on the first and the second substrates.